Space Weather Forecast

Issued on Friday, 29 October 2021 at 13:09 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Large CME expected to arrive at Earth later on Saturday 30th into Sunday 31st. Average G1/G2 minor to moderate storming with a likelihood of G3 at times. Chance of Aurora sightings for Northern UK. Chance of further moderate flares from sunspots.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity has been High with a low-end X-class flare yesterday at 1535UTC (resulting in a large CME and small radiation storm) and was followed by a couple of other Moderate to Common-class flares. There are five sunspot regions in total on the Earth-facing solar disc, with two notable regions giving the bulk of the flare potential, whilst the three other regions are small and simple and unlikely to flare. The CME was significant and is Earth-directed, and is expected to arrive at Earth later on in the day on Saturday 30th, lasting into Sunday 31st.

Solar Wind / Geomagnetic Activity: Solar winds were at background low levels, with speeds of around 300km/s (very ambient for the solar wind). The magnetic field carried by the wind was very weak with no notable component in the important north-south direction. Geomagnetic activity remained Quiet (Kp0-2).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was at background until after the strong flare yesterday. The proton storm reached S1 (Minor) levels which started from 28/1735UTC and has remained at S1 since, albeit on a declining trend.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to Low solar activity is forecast with further Moderate-class flares possible. These most likely from either of the two moderately complex sunspots currently on the solar disc.

Solar Wind / Geomagnetic Activity: A large CME from an X-class flare eruption on the 28th has been analysed and is forecast to arrive at Earth during the second half of Day 2 (30th), most likely around 1600UTC. Geomagnetic activity is expected to be quiet until then (Kp0-2). During the CME transit, minor to moderate geomagnetic storms (G1/G2 Kp5-6) are expected, with a likelihood of isolated G3/Strong storms (Kp7). Geomagnetic activity is then expected to gradually subside during the latter part of Day 3 into Day 4 (31st October into 1st November) with an eventual return to mainly Unsettled levels, with a chance of Active intervals (Kp2-4).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) will continue to be at S1/Minor storm level for the rest of today. In the absence of any further significant flares the high energy proton flux is expected to return to background levels during Day 1, but with a continued slight chance of reaching the S1 level again with any notable

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flares, or during the CME impact itself.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	90	80	40
Strong	G3	No	1	60	60	5
Severe	G4	No	1	10	10	5
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	50	40	40
Very Active	R3 to R5 X	Yes	10	10	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	30	10	20
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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